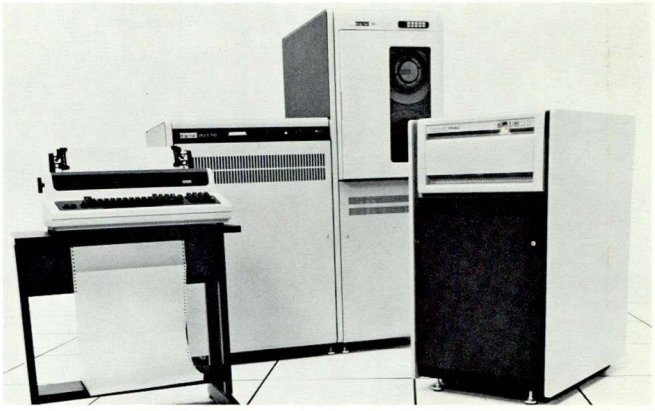
VAX-11/750

October 1980

The VAX-11/750 is the mid-range member of the VAX family of computer systems. It features both VAX-11/780 compatibility and 32-bit processing at a low price. In addition to sharing the identical set of system software with the VAX-11/780, the VAX-11/750 also features compatibility with the VAX-11/780 peripheral set via the UNIBUS and optional MASSBUS adaptors. The processor uses a 32-bit architecture for addressing modes, arithmetic operations, and data path using a microcoded machine technique.

The VAX-11/750's operating system is VAX/VMS (Virtual Memory System). A general purpose, multiprogramming operating system, VAX/VMS simultaneously handles multiuser, realtime, and multistream batch applications, plus on-line program development.



HIGHLIGHTS

- 32-bit virtual memory computer with 4 gigabytes of address space allowing for large programs without overlays
- Advanced semiconductor technology implementation that reduces the physical size and power requirements, and increases reliability
- Extensive reliability, maintainability, and availability features including automatic error checking, VAX/VMS on-line diagnostics, and a Remote Diagnostics option
- 4 Kbyte CACHE
- 8 EIA communications lines
- 256 Kbyte tape cartridge drive
- Expansion to 2 Mbytes of Main Memory
- Direct memory access I/O for the UNIBUS or MASSBUS (optional) adaptors
- Power fail automatic restart
- Hardware Bootstrap Load for up to 4 different devices
- LA38 DECwriter IV console printing terminal
- Full VAX Instruction Set, including over 240 basic operations, 9 adressing modes, 6 data types, and PDP-11 Compatibility Mode Instructions
- Realtime Clock and Time of Year Clock

DESCRIPTION

The VAX-11/750 is a high-performance computer system that implements VAX Family architecture, thus making it completely software compatible with other VAX Family systems. Programs written for one VAX system can run without modification on any other VAX system. Data and software compatibility with PDP-11s is provided by utilization of the same disk or tape file formatting and through PDP-11 compatibility mode instructions.

CENTRAL PROCESSOR

The Central Processing Unit (CPU) of the VAX-11/750 system is a microprogrammed computer that executes a large set of variable-length instructions in native mode, and nonprivileged PDP-11 instructions in compatibility mode.

The native mode instruction set is highly versatile and bit-efficient. It includes integer, packed decimal, character string, single and double precision (32 and 64-bit) floating point instructions, and bit field data types, as well as program control and special instructions that improve both the performance and the memory utilization of systems and applications software. Instructions are variable in length and can start on any byte boundary.

In compatibility mode, the processor executes the user set of PDP-11 instructions, recognizes integer data, and uses eight 16-bit general purpose registers. This allows the VAX-11/750 user to run most existing nonprivileged RSX-11M/S software, including compilers, utilities and user programs. Programs that use compatibility mode instructions can execute concurrently with native mode programs.

Registers and Cache Memory

The processor provides sixteen 32-bit registers that can be used for temporary storage, and as accumulators, index registers, and base registers for user application programs.

The VAX-11/750 Memory Cache is a 4 Kbyte, direct-mapped, write-through cache. The memory cache reduces the effective CPU access time to memory to 400 nanoseconds with a 90% hit rate. The write-through fea-

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ture protects the integrity of memory because memory contents are updated immediately after the processor performs a write.

The VAX-11/750 processor has a Translation Buffer that contains 512 virtual-to-physical page address translations. It significantly reduces the time spent on virtual to physical address translation. The VAX-11/750 also has an 8-byte instruction prefetch buffer that improves CPU performance by prefetching and decoding data in the instruction stream. The control logic fetches longword data from memory to keep the 8-byte buffer full.

Clocks

Two clocks are contained in the VAX-11/750 processor. The high-resolution, programmable, realtime clock is used by systems diagnostics and by the VAX/VMS operating system for accounting and scheduling. The time-of-year clock, with its own battery backup, is used by the operating system to enable unattended automatic restart following any service interruption, including a power failure.

I/O Subsystems

A UNIBUS adaptor supports general purpose options and devices. The maximum I/O rate through one of the 3 buffered data paths is 1.5 Mbytes per second. The VAX-11/750 UNIBUS adaptor has direct vectored interrupts.

Up to three optional MASSBUS adaptors can be plugged into the basic VAX-11/750. This allows connection for up to 24 MASSBUS disk or tape drives on a single VAX-11/750. An individual MASSBUS has a maximum I/O rate of 2 Mbytes per second.

RELIABILITY, AVAILABILITY, AND MAINTAINABILITY

The reliability, availability, and maintainability features designed into the VAX-11/750 system are extensive. VAX/VMS, for example, has powerfail recovery code; on-line system error logging; dynamic bad block handling; on-line functional diagnostics concurrent with user programs; and a user environment test package (UETP). Some of the other features are listed below.

- The CPU has ECC MOS Memory with a battery backup option; ability to turn off malfunctioning CACHE and continue to operate in degraded mode; CPU integrity diagnostic run during power up; VAX processor board count is reduced to five modules(due to custom LSI technology); System ID register; parity checking on MASSBUS data, CACHE, translation buffer, and CPU microcode; and single board options for MBA (MASSBUS Adaptor) and UCS (User Control Store)
- The power supply has a simple removal and replacement procedure; sensing and visual indicators for short circuit, overvoltage, loss of power and regulator board failure; and an airflow sensor that powers the system down on blower failure
- Components are easily accessible for servicing
- Environmental and mechanical features include 15KV static immunity; thermal and airflow sensing; UL and CSA approval; fixed-mounted Card Cage, thus no service loops on CPU cables; and bootstrap select from multiple disk types on front panel
- The backplane allows direct connection of I/O cables onto the backplane pins instead of the CPU modules. Almost all interconnections are etched into the backplane printed circuit board with very little wirewrapping required

Console Subsystem

The VAX-11/750 Console subsystem is designed to allow the user to give commands interactively to the CPU using the console terminal and the console command language. The console subsystem is made up of the integral TU58 tape cartridge unit and the LA38 (DECwriter IV) console terminal. The LA38 serves as an operating system terminal for control and error logging, and as a system console. Additionally, the LA38 is a diagnostic console with the Remote Diagnostic Module (RDM) option. The TU58 may be used as a load device for diagnostics and software updates, as well as a convenient storage medium (up to 256 Kbytes) for personal data and programs.

The remote diagnosis module is an option available to customers with a full, Digital maintenance contract. It provides the customer with dial-in diagnosis, including detection of failures down to the board and chip level, and diagnostic capability even on an inoperative CPU.

SUPPORTED SOFTWARE

VAX/VMS Operating System

VAX/VMS is a high-performance operating system that complements the VAX-11/750 hardware. VAX/VMS can support many user environments, including realtime processing, interactive program development, and batch processing, running independently, concurrently, or in any combination. VAX/VMS includes a highly efficient scheduling algorithm, extensive record and file management capabilties, and virtual memory features achieved by an extremely efficient paging algorithm.

Languages and Utilities

VAX/VMS offers a large choice of languages and utilities:

- VAX-11 COBOL
- VAX-11 FORTRAN
- VAX-11 BASIC
- VAX-11 PL/I
- VAX-11 PASCAL
- VAX-11 CORAL 66
- VAX-11 BLISS-32
- VAX-11 MACRO
- VAX-11 FMS
- VAX-11 DATATRIEVE
- VAX-11 DECnet
- VAX-11 MUX200
- VAX-11 DSM (Digital Standard MUMPS)
- VAX-11 2780/3780

VAX/VMS also provides program development and maintenance utilities including an interactive and a batch editor, a linker with cross-reference ability, and a symbolic debugger.

SYSTEM CONFIGURATIONS

The VAX-11/750 is available in any of three complete Packaged Systems. All three systems are based on the 11/750 CPU, 8 line communication multiplexer, an LA38 console terminal, a choice of mass storage subsystems, the VAX/VMS operating system, and a minimum of 512 Kbytes of memory. The three choices of mass storage subsystems include dual RK07s (28 Mbytes each), the RM80 (124 Mbytes) disk and controller combined with a TS11 magnetic tape drive, or the RM03 (67 Mbytes) disk and controller with a TS11 magnetic tape drive.

PRINTED IN U.S.A. ED 19752 18/80 090 03 32